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MESSAGE

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

REPORT TO CONGRESS ON AERONAUTICS AND SPACE ACTIVITIES, 1965

JANUARY 31, 1966.—Referred to the Committee on Science and Astronautics and ordered to be printed with accompanying papers and illustrations

To the Congress of the United States:

The record of American accomplishments in aeronautics and space during 1965 shows it to have been the most successful year in our history.

More spacecraft were orbited than in any previous year. Five manned Gemini flights were successfully launched.

Our astronauts spent more hours in space than were flown by all of our manned spacecraft until 1965. Ten astronauts logged a total of 1,297 hours 42 minutes in space.

The five manned flights successfully achieved included a walk in space, and the first rendezvous between two manned spacecrafts.

A scientific spacecraft completed a 325-million-mile, 228-day trip to Mars. Mariner 4 thereby gave mankind its first closeup view of another planet.

The Ranger series, begun in 1961, reached its zenith with two trips to the moon that yielded 13,000 closeup pictures of that planet. The entire Ranger series produced 17,000 photographs of the moon's surface which are being studied now by experts throughout the world.

Equally important were the contributions of our space program to life here on earth. Launching of Early Bird, the first commercial communication satellite, brought us measurably closer to the goal of instantaneous communication between all points on the globe. Research and development in our space program continued to speed progress in medicine, in weather prediction, in electronics—and, indeed, in virtually every aspect of American science and technology.

As our space program continues, the impact of its developments on everyday life becomes daily more evident. It continues to stimulate

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The laboratory will be equipped to accommodate two men in orbit for about 30 days and to provide them with pressurized and unpressurized experimental working space adequate for the planned activities. The orbital vehicle will be ten feet in diameter and about 50 feet long.

A modified GEMINI capsule, GEMINI B, will be used to house the men during transport to orbit and to return them to earth following the orbital mission. Access to the laboratory in orbit, from the capsule, will be through a hatch in the heat shield and a pressurized tunnel.

The planned launch vehicle is the TITAN IIIC. The manned launches will be flown out of the Western Test Range and will be accomplished with the assistance of seven segment solid rocket motors rather than the five segment motors employed in the early vehicle development flights. These larger motors will provide about 20% increase in low orbit payload capability.

The ground network for tracking and orbital control will be based on the best choices of existing DOD and NASA facilities. This network will be determined, with NASA participation, during the current Contract Definition period.

There will be at least five manned launches in the presently conceived program extending into CY 1970. There will be early unmanned launches using TITAN IIIC vehicles from the current vehicle development program. These launches are due to begin late next year or early 1967 out of the Eastern Test Range. The initial unmanned launch of a fully-equipped MOL will test critical elements of the system including the modified GEMINI and the laboratory module.

NASA will examine the MOL to determine the feasibility of executing experiments of a general scientific and technological interest. The Air Force will accommodate these experiments on a minimum interference basis.

As in the past, NASA and DOD will continue to work closely together to insure that the manned space flight effort of both agencies is fully coordinated. Although the MOL will primarily have defense objectives, the continued close relationship between DOD and NASA will insure that the program remains integrated with the national effort.

Astronaut candidates are military test pilots and graduates of the Aerospace Research Pilot School at Edwards Air Force Base, California.

The MOL program advanced into the Contract Definition Phase in the latter half of 1965. The purpose of this phase is to complete the engineering definition, to establish the base line configuration and to initiate developmental hardware procurement.

TITAN III Program

The flight test program of TITAN III initiated in 1964, continued with a high degree of success during 1965. Five flights were flown--two TITAN IIIA's and three TITAN IIIC's.

The third TITAN IIIA of the program was launched February 1965, and injected a communication research satellite into orbit. On May 6, 1965, the next and fourth TITAN IIIA was launched from Cape Kennedy. Two payloads were carried aboard this flight and successfully injected into planned orbits. Payloads were an experimental communication satellite (LES-2) and a radar calibration sphere.

The highly successful TITAN IIIA flights resulted in a decision to cancel the one remaining planned TITAN IIIA flight and convert the vehicle to a TITAN IIIC configuration. Flight test planning and activity then centered on the launch of the first TITAN IIIC configured vehicle. The initial flight of the first TITAN IIIC occurred on June 18, 1965. Three notable space records were achieved in the course of its first flight:

a. most powerful vehicle ever launched with the booster solid rocket motors developing 2,400,000 pounds of thrust at lift-off.

b. most powerful rocket engine ever ignited in flight. These engines developed 470,000 pounds of thrust when started at altitude.

c. one of the heaviest payloads ever orbited by a vehicle (TITAN IIIC's Transtage, which propelled the 21,000 pound ballast payload into orbit, is not included as part of payload weight).

The second and third TITAN IIIC's were launched in October and December and both further contributed to the progress of the R&D program. After achieving orbit, some difficulties were encountered in the Transtage on both the October and December TITAN IIIC flights which resulted in only partial mission successes. However, in the latter case the scheduled payloads were placed in orbit.

At Cape Kennedy the Integrated Transfer Launch (ITL) facilities were completed for the TITAN III. This is a dual launch pad facility and provides a high launch rate capability.

Recognizing the need to be responsive to all payloads and mission requirements, effort has been initiated to achieve an initial launch capability at the Western Test Range. This capability will provide support for polar or near polar mission requirements that would be degraded if flown from Cape Kennedy.

Early in the year, an examination of requirements for the TITAN III led to an adjustment of the R&D program schedule. This step was taken to insure better compatibility between the completion date of the R&D program and the time period when operational use of the TITAN III is anticipated. Thus, the remaining TITAN IIIC vehicles will be flown at regular intervals over the next eighteen months, and will be assigned useful engineering payloads.

DOD Satellite Communications Activities

The present satellite communications activities within DOD reflect, in the broadest sense, four important factors:

a. the continued vital United States need for prompt, reliable, secure and flexible communications to support its global responsibilities, command its global forces, and control its weapons.

b. the demonstrated ability of orbiting satellite repeaters, when used with appropriate surface terminals and transmission techniques and incorporated into proper overall system designs, to provide communications channels which are much more survivable, reliable, flexible and secure than those generally available through the use of high frequency radio, undersea cable, and similar conventional schemes.

c. the growing reliability of powerful boosters and sophisticated satellites which promise to provide novel and economic means of meeting very difficult tactical-mobile communications needs; and

d. the emergence of the Communications Satellite Corporation as an important element in national commercial and military communications planning.

Defense Communications Satellite Program (DCSP)

The objective of the Defense Communications Satellite Program is "to develop the technology required for an operational system in a timely manner." With the Defense Communications Agency acting as the focal point, the Army has the responsibility for the surface environment comprised of fixed and transportable ground stations, the Navy has the responsibility for shipborne stations and the Air Force is responsible for the satellites, and launch vehicles. The Defense Communications Agency is responsible for the operation of the Satellite Communications Control Facility.

To accomplish the DCSP objective, the program has been divided into three projects as follows:

a. SYNCOM

b. Initial Defense Communications Satellite Project (IDCSP)

c. Advance Defense Communications Satellite Project (ADCSP)

SYNCOM was a joint effort between the National Aeronautics and Space Administration and the Department of Defense to demonstrate the feasibility of communication via synchronous satellite.

In March 1965 NASA completed the maneuvering of SYNCOM II over the Indian Ocean to stop its westward movement and to allow the satellite to stabilize its position at the triaxial nodal point near 77°E longitude. The estimated remaining communications life of SYNCOM II is two years.

Complete control of the SYNCOM Satellites (II and III) was transferred from NASA to DOD on 1 April 1965. Control of the satellites, i.e., tracking, ephemeris computations, commanding and telemetry readout and analysis was assumed on that date by the USAF. Satellite usage and scheduling control was retained by DCA. The U.S. Army continues to operate and maintain the associated ground communication stations

and to conduct the various R&D tests.

During the past year DOD has conducted a number of technical and operational R&D tests. The basic engineering tests conducted by DOD for NASA were completed in March 1965. Tests to determine the effect of satellite communications on various types of data transmission have continued since DOD assumed control of the satellites. Ground communications stations are at various locations throughout the world. A terminal located at Camp Roberts, California, was in use until September 1965 when its modification for use with the IDCSP began. Another terminal, installed on the USNS Kingsport has participated in numerous tests, its use to support the GEMINI flights being the most important during 1965.

SYNCOM III was kept on station between 170° and 174°E longitude until October 1965. Since then the satellite was given a westward drift. It is currently planned to keep the satellite between 135° and 162°E longitude if sufficient control gas remains to stop the satellite when it reaches 135°E longitude in approximately three years. The SYNCOM III communications life remaining is estimated to be no less than five years.

Initial Defense Communications Satellite Project (IDCSP)

The basic objectives of the Initial Defense Communications Satellite Program are as follows:

a. perform research, development, test, and evaluation to demonstrate system operational feasibility.

b. obtain an emergency capability as early as possible to supplement the Defense Communications System for essential command and control.

c. establish a research and development system in being, convertible and expandable to an operational system.

The IDCSP is divided into two phases. During the first phase, research and development assets will be deployed to provide a number of earth terminals and randomly dispersed satellites for system test and evaluation. The initial ground system will consist of two terminals in CONUS, two in West Europe, two in Africa, two in the Western Pacific, and two in Hawaii. The space system will be established by three TITAN IIIC R&D launches, carrying eight communications satellites each, to be injected into a near-synchronous equatorial orbit. Each satellite will be given a different drift rate to achieve random dispersion.

Following the test and evaluation phase, the IDCSP will provide a limited communications capability to satisfy certain unique and vital requirements of the DOD. Additional terminals will be acquired and deployed to establish communications links in accordance with military requirements validated by the Joint Chiefs of Staff. Most of these additional terminals will be lightweight and highly transportable. The satellite population will gradually degrade due to normal satellite failures; a replenishment launch is planned approximately two years after the initial launch.

Advanced Defense Communications Satellite Project (ADCSP)

The Defense Communications Agency conducted operational and technical requirements definition and system definition studies which would define an Advanced Defense Communications Satellite Project (ADCSP). The objective of this ADCSP is to provide the Department of Defense with an operational communications satellite capability late in this decade and beyond to more fully satisfy unique and vital national security needs. Six funded contractual approaches and specific inputs from each of the services are being obtained. The composite system design will incorporate the best elements of each.

Tactical Satellite Communications Program (TSCP)

Tactical/Mobile satellite communications studies were inaugurated in 1965 with an initial analytical study being conducted by R&D and operational personnel of the three Services.

The first DOD effort in the tactical-mobile field will involve an experiment primarily addressed toward improving the long range communications of the Air Force's Strategic Air Command. A satellite repeater will be placed into a high orbit as a piggyback payload from a TITAN IIIC development launch late next year. Several SAC aircraft as well as Army and Navy mobile terminals will be employed, under operating conditions, to study methods of utilizing such a satellite repeater and observing the specific value of having available secure teletype channels of extremely high reliability and great range.

Experimental Communications Satellites

Two experimental satellites were placed in orbit on 6 May 1965 as a "bonus" payload on the fourth TITAN IIIA launch. One satellite, designated LES-2, is a communications transponder and the second of a series of experimental satellites designed to test realistically, in a 1500 and 8000 nautical mile elliptical orbit, a number of devices and techniques being developed for possible use in future military communication satellites and satellite communication systems. The second payload was a 44-1/2 inch diameter aluminum sphere weighing about 75 pounds placed in a 1500 nautical mile orbit for use as a test target to calibrate powerful radar and radio systems.

The LES-2 satellite is being used to test such devices and techniques as an all solid state communications transponder, an earth sensing and antenna switching system to attain antenna gain from a spinning spacecraft, a magnetic spinning spacecraft, and a magnetic spin axis control system to increase power output.

Project WEST FORD

In 1965, orbital decay measurements of 480 million fibers 1.8 centimeters long and .0018 centimeters in diameter placed into orbit for Project WEST FORD, confirmed predictions that the first particles will reenter the earth's atmosphere in February 1968 and be consumed in the process.

Technological advances in active space communication satellites have resulted in decreased interest in passive reflectors. As a result, no further launches of reflective dipoles are contemplated at this time.

Spaceborne Nuclear Detection (VELA)

The VELA Satellite Program is designed to develop a satellite-based nuclear detection capability for events occurring on the earth's surface to the outer reaches of deep space. It is a research and development program of the Advanced Research Projects Agency, and is conducted jointly by the USAF and AEC.

Two more VELA satellites were launched into orbit in July 1965. The first four, which were orbited in 1963 and 1964 are still operating. These satellites are providing useful information on radiation background and the operation of nuclear test detection sensors in space. They also provide an interim monitoring capability for detecting clandestine nuclear explosions at high altitude and in space, which is particularly significant because of the Nuclear Test Ban Treaty. All of these satellites have been launched from Cape Kennedy into near-circular orbits about 60,000 nautical miles from the earth. With each launching, they have contained improved and additional sensors to investigate nuclear test detection capabilities and to establish a better baseline of space background radiations. The radiation background data is also of general interest to the scientific community for studies of particles trapped in the earth's magnetosphere and solar and galactic radiation. The test data is being used by the DOD in cost and capability studies of various concepts of worldwide operational nuclear detection systems.

Space Surveillance

The Advanced Research Projects Agency, the Air Force, and the Navy are conducting research in space object identification to determine the extent and best means by which the physical characteristics of uncooperating objects in earth orbit can be determined through observations by ground-based radar. In addition to providing a possible source of diagnostic information on our own satellites in orbit, such advanced radar techniques should make available continuing technology for updating the capabilities of the Space Surveillance and Detection Tracking System (SPADATS) in support of anti-satellite systems.

Geodetic Satellite

The Department of Defense continued its active participation in the National Satellite Geodetic Program during 1965. The NASA's EXPLORER XXIX satellite, (GEOS I) launched November 6, 1965, is being observed and tracked on a worldwide basis by DOD as well as other participating Government agencies. EXPLORER XXIX carries an Army SECOR transponder, a NASA Range-Range Rate transponder and LASER reflector, an Air Force optical beacon, and a Navy Doppler beacon. The project will continue to provide more precise information about the earth's size, shape, mass and variations in gravity and precise determinations of locations for accurate mapping and charting.

Two additional geodetic SECOR (Sequential Collation of Range) satellites were successfully orbited in 1965. These spacecraft are being used, as part of the Department of Defense effort, in the Army Corps of Engineers geodetic satellite program to locate the positions of certain Pacific Islands and the North American datum. Tests of techniques for using SECOR satellites at higher altitudes have been initiated as the first step in a project to locate points in an around-the-world belt. The objective of this program is to improve our knowledge of the earth's

diameter and to connect all major geodetic datums. The SECOR system is producing accuracies of one part in two hundred thousand.

The Navy is routinely determining the positions of tracking stations anywhere on earth to an accuracy of about 25 meters with respect to the earth's center of mass. The same Doppler data is used to determine the harmonic coefficients of the earth's gravity field. Coefficients through the eighth order have been published. This accuracy is sufficient to allow the prediction of a satellite's position changes due to gravity field variations to an accuracy of better than 75 meters over a 24-hour period. This figure compares with a probable error of well over a mile, five years ago. The Doppler beacons in the Navy Navigation Satellites, as well as those in the NASA Beacon Explorer Satellites, are being used for this purpose.

Navigation Satellite Program

The Navy Navigation Satellite System, which was declared operational by the Department of Defense in July 1964, has continued to operate satisfactorily during the past year. The system at the present time is providing accurate navigation information to submarines and selected surface ships. During 1965, the satellite navigation capability has been expanded by installing receiver equipment aboard attack aircraft carriers operating in Southeast Asia. This addition of worldwide all-weather accurate navigation capability has proven to be extremely valuable to the attack carrier mission. In an effort to simplify navigation satellites and the navigation receiver equipment, the Navy, during 1965, began an investigation into the feasibility of long term orbital predictions that would make possible the publishing of an ephemeris almanac for use aboard ship. The Navy is also seeking to increase the cost effectiveness of this system by developing a family of receiver equipment that could be used in differential positioning in aircraft and in smaller ships. The Navy is continuing to stress the development of satellite reliability and mean-time between failure in order to achieve a five-year satellite lifetime in orbit.

SPACE GROUND SUPPORT

DOD National Ranges

The 1964 realignment of the National Range Complex to provide centralized planning and management of this $3 billion capital plant resulted in cost savings and a better response to NASA and DOD programs. A decision to provide a national fleet of instrumented range aircraft to meet both DOD and NASA needs deleted the requirement for six additional jet aircraft, thereby avoiding a heavy capital investment and an annual operation cost of approximately $3.9 million. DOD and NASA reached agreement on the division of responsibilities in management and operation of collocated ground-tracking stations. The agreement covers policies and responsibilities for mutual support, operation and management, and is expected to result in significant economies at these stations. On 1 May 1965, the Canton Island Station was transferred to NASA and on 1 June 1965 the Kokee Park, Hawaii Station was transferred to NASA. The South Point, Hawaii Tracking Station was deactivated on 30 September 1965 and its workload transferred to the NASA Kokee Park and Air Force Kaena Point Stations.

Under the concept of a combined range instrumented ship fleet to support all programs anywhere in the world, the USS H.H. Arnold and the USS H.S. Vandenberg were

re-deployed from the Atlantic to the Pacific to support penetration aid and modified and instrumented reentry systems testing. The first of five range ships being built in support of the APOLLO program by joint Navy-Air Force-NASA efforts was launched on 9 September 1965.

On 1 February 1965, the Air Force Western Test Range assumed responsibility from the Navy's Pacific Missile Range for range functions in support of missile and space system launches from Vandenberg Air Force Base. This action was in compliance with a DOD decision to establish a Pacific area ICBM and space vehicle range.

Space Detection and Tracking System (SPADATS)

The Air Force SPACETRACK System together with the Navy Space Surveillance System (SPASUR) make up the principal elements of the North American Air Defense Command SPADATS. This global system detects, tracks and catalogues all space objects in earth orbit. SPADATS functions not only as a defensive detection and tracking system, but performs important functions in assisting our national manned space flight program. During the NASA GEMINI 5 rendezvous and docking radar pod experiment, SPADATS provided the astronauts with frequently updated traffic forecasts, i.e., positions of other space objects relative to the GEMINI 5 spacecraft. During those periods of flight when the spacecraft beacon was ineffective because of spacecraft electrical power problems, SPADATS provided NASA with the primary tracking data. Additionally, SPADATS provided the only source of information concerning separation distance between GEMINI 5 and the radar evaluation pod which was co-orbiting with the GEMINI vehicle.

AERONAUTICS DEVELOPMENT ACTIVITY

C-5A Transport Aircraft

The Air Force, in October 1965, was directed to proceed immediately to develop and to produce a revolutionary new transport aircraft, the C-5A. The gross weight of this airplane will be more than 700,000 pounds or 350 tons at take-off. This is more than twice the weight of the largest military cargo plane today. This new aircraft will be able to carry loads of 220,000 pounds over distances of 3200 miles. For nonstop hauls across such large distances as the Pacific, the plane will have a capability of carrying 100,000 pounds as payload. It will be more than 230 feet long, 63 feet high and have a wing span of about 220 feet. The development cost and the initial production order for 58 airplanes, including the engines, will be about $2 billion.

The aircraft and its engines will be bought under a new purchasing concept within which both the airframe and the engine manufacturers will receive contracts to cover not only the research and development of the aircraft but also its production.

This should assure that this large and complex program will be carried out at the lowest possible cost. The C-5A will be able to land on support area air fields approximately 4,000 feet in length, which is a short landing distance for an aircraft of this size.

The C-5A will greatly extend the capability of support over large distances. The plane will carry almost any piece of military equipment, including tanks, trucks, and

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andum of Understanding established principles to utilize the Air Force XB-70 aircraft in support of the national supersonic transport program. Based on such principles, it is planned to conduct a joint USAF-NASA research program which will utilize the two XB-70 aircraft. The joint program will commence after the completion of the current Air Force program, expected to be completed by April 1966. After that time, under the joint effort, first priority will be given to the support of the NASA XB-70 flight research program. Provisions are made for mutual fiscal support.

In February 1965 the Army and NASA entered into an agreement for use and support of certain facilities owned by NASA and located at Ames Research Center. Under this agreement NASA is making available its 7x10 foot wind tunnel for use by the Army. In addition, the Army is participating in NASA's Low-Speed Aeronautical Research at that facility.

Secondary Payloads for Launch Vehicles

It is not unusual for a particular primary space experiment not to require the full space or weight carrying capacity of its assigned launch vehicle. Thus, opportunities are available to accommodate additional or secondary payloads. Recognizing the need to utilize the full capacity of NASA and DOD launch vehicles, particularly the large launch vehicles now becoming available, parallel procedures are being developed for this purpose and are being coordinated by NASA and DOD.

Reusable Launch Vehicle Technology

For the past several years consideration has been given to the desirability of a launch vehicle that could be recovered and reused. Although the advantages of such a vehicle have not been fully analyzed, it is necessary to support technologies that could contribute to such capability. A review and assessment of these technologies is being undertaken by an ad hoc subpanel of the Aeronautics and Astronautics Coordinating Board. This study will assist in evaluating the technical feasibility, potential operational applicability, and the advantages or limitations of the reusable launch vehicle concept.

Facilities Coordination

NASA and DOD are engaged in the construction of new facilities to meet their respective needs. In order to assure that neither agency constructs new facilities that would unnecessarily duplicate existing or planned new construction of the other agency, a formal procedure of coordination is conducted each year. Under these procedures, the proposed construction of facilities by each agency in FY 1967 have been jointly reviewed, compared, and coordinated.

Coordinated USAF/NASA Advanced Hydrogen-Oxygen Rocket Engine Program

The Air Force and NASA have throughout the year conducted exploratory development in this area of mutual interest to examine the problems associated with the program. The success of component investigations on two high pressure engine concepts has encouraged the USAF and NASA to consider the integration of these components into mockup engine demonstration programs.

In order to prevent duplication of efforts between DOD and NASA in this area, a

Joint Memorandum of Agreement was worked out. This agreement was a stepping stone from which a national program plan evolved. The plan contains each agency planned activities in advanced hydrogen-oxygen rocket engine development through calendar year 1969.

DOD Participation in the GEMINI Program

The objective of the DOD interest in the GEMINI program is to raise the DOD experience level by evaluating techniques and equipment on NASA GEMINI flights. Results of the DOD experiments are expected to be important inputs to the Manned Orbiting Laboratory program. DOD participation also provided a mechanism for the timely flow of data from the NASA manned space flight activities to DOD agencies in 1965.

During 1965 DOD continued to refine thirteen Air Force and three Navy experiments. The need for one Air Force experiment requiring an astronaut to leave his space capsule was eliminated, but two DOD experiments were flown on GEMINI 4 and six on GEMINI 5. Action for flight hardware design, fabrication and integration into the GEMINI spacecraft on the remaining experiments proceeded on schedule.

Joint Navigation Satellite Committee

With the agreement of NASA, DOD, Department of Commerce, Department of Interior, Department of Treasury, and FAA, an interagency committee was established for the purpose of evaluating possible requirements and costs for alternative systems, including a new satellite system "to meet future needs in air and sea navigation, air and sea traffic control or coordination, air-sea emergency rescue, and related data transmission."

General Range Support by DOD for NASA Programs

The Defense Department is continuing to provide extensive service to NASA programs in the launch area at Cape Kennedy, Vandenburg Air Force Base, and at Eastern Test Range stations through the Caribbean and into the South Atlantic Ocean as far as South Africa. Worldwide Defense Department resources for range and network support and for planned and emergency recovery of astronauts are marshalled under the control of the DOD Manager for Manned Space Flight Support Operations in connection with GEMINI missions. Plans are being made for extension of the same type of support to the APOLLO program.

National Range Ships for APOLLO Support

Contracts have been let and modifications are under way to augment the National Range Ship Fleet to provide instrumented ship support of APOLLO. Three ships will cover insertion of the APOLLO spacecraft into earth orbit and injection of the spacecraft into a lunar trajectory. Two additional ships are being outfitted to assist in recovery of the spacecraft upon its return to earth.

Instrumented Aircraft Support for APOLLO

Eight C-135 aircraft are being modified to collect data and to provide communication with the APOLLO spacecraft during the critical period of departure from earth orbit

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DEPARTMENT OF STATE

CHAPTER VI

INTRODUCTION

The Department welcomed the President's decision in 1965 to make greater use of our astronauts in telling abroad the story of the U. S. space effort. These brave and forthright men have done more in a few months to strengthen bonds of friendship between the United States and the many countries they have visited than could have been achieved in as many years by more conventional diplomacy.

The President's decision to send a top-level commission to Europe early in 1966 to consult with governments of Europe "wishing to participate in the joint exploration of space" promises to open a new chapter in United States space cooperation with other nations. The President's initiative, and the transatlantic consultations during the first months of 1966 resulting therefrom, are expected to stimulate governmental, scientific, and industrial experts in Europe to think about ways in which their space aspirations can be better realized through closer collaboration with the United States, for the benefit of all mankind. This type of cooperation among the European nations themselves is very much in line with U.S. foreign policy objectives.

The Committee reaffirmed the recommendations contained in its 1964 report, on which the General Assembly had not yet taken action, and recommended that the Legal Subcommittee resume its work in the first part of 1966. The Committee also decided that a working group established to study the desirability, organization, and objectives of a 1967 international conference or meeting on the exploration and peaceful uses of outer space should meet in January 1966. The Committee noted with appreciation the reports of the International Telecommunication Union and the World Meteorological Organization in the field of outer space.

At the Twentieth Session of the General Assembly, the U.S. Ambassador to the United Nations opened the First (Political) Committee's discussion of international cooperation in the peaceful uses of outer space with a major address on December 18. He emphasized cooperative activities of direct interest to the developing countries and the Member States which do not have large space programs, such as weather and communications satellite programs, the U.S. invitation to foreign scientists to propose experiments for inclusion on NASA satellites, joint sounding-rocket and satellite-launching programs, distribution of Ranger photographs of the moon to scientists in other countries for professional analysis, and educational opportunities in the United States. The Ambassador stressed the need to carry out space programs in an open and generous manner and invited his colleagues to inform him if they wished to visit Cape Kennedy or other NASA centers. He specifically invited all nations represented in the U.N. to examine the American space program for projects, interesting to them as well as to the United States, which could be carried out cooperatively on a realistic and manageable basis. Recalling his

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suggestion of September 23 that the United Nations begin work on a comprehensive treaty on the exploration of celestial bodies, he said that the United States plans to present a definite proposal as to the contents of such a treaty.

On December 20, the First Committee adopted a resolution based on the report of the Space Committee and co-sponsored by thirteen members of that Committee, including the United States. The resolution was adopted unanimously in a plenary session of the Assembly on December 21. It recognized that the benefits of space exploration can be most widely enjoyed if Member States support the widest possible exchange of information and promote international cooperation; asked member States to cooperate with the Space Committee's program; urged the Space Committee to continue work on the assistance and return and liability agreements; endorsed the Space Committee's recommendations on scientific and technical cooperation; accorded U.N. sponsorship to the International Equatorial Sounding-Rocket Launching Facility at Thumba, India; and requested the Committee to consider suggestions for programs of education and training in the peaceful uses of outer space to assist the developing countries.

The Department, through its scientific attaches and scientific affairs officers at embassies abroad, was pleased to forward promptly for foreign scientific appraisal the historic television photographs of the Martian surface taken in July 1965 by the MARINER IV spacecraft. Copies of selected photographs were also forwarded to our ambassadors for presentation purposes as soon as they were available. Activities such as these help make clear our genuine desire to share with the world the knowledge we gain from space exploration.

ACTIVITIES WITHIN THE UNITED NATIONS

On September 23, 1965, in his speech during the general debate of the U.N. General Assembly, Ambassador Goldberg stated that in accordance with ground rules laid down by the General Assembly, U.S. space activities had been, and would continue to be, non-aggressive, peaceful, and beneficial in character. He suggested that the United Nations, in order to keep pace with technical progress in space, begin work on a comprehensive treaty on the exploration of celestial bodies.

The Legal Subcommittee of the U.N. Committee on the Peaceful Uses of Outer Space met in New York from September 20 to October 1, 1965. The purpose of the meeting was to continue consideration of draft international agreements on: (1) assistance to and return of astronauts and space objects, and (2) liability for damage caused by objects launched into outer space. On the question of liability, the United States and Hungary introduced revised texts, and some area of agreement evolved among members of the Committee. Due to the complexity of the subject, however, much work remains to be done. On the question of assistance to and return of astronauts and space objects, the Subcommittee regrettably failed to reach an agreed text.

The Committee on the Peaceful Uses of Outer Space met in New York from October 5 to 8, 1965. Most of the session was devoted to a general debate in which new light was cast on the space programs and activities of member states. In his general statement, the United States Representative concentrated on various U.S. cooperative space efforts.

TRACKING NETWORKS

NASA Facilities

Government-to-Government agreements by exchange of notes are in existence with the following countries covering the foreign portion of NASA's global tracking network: Australia, Canada, Chile, Ecuador, Malagasy Republic, Mexico, Nigeria, Peru, South Africa, Spain, and the United Kingdom. These facilities consist of nine stations in support of the manned space flight program, an eight-station tracking and telemetry network for scientific satellites, and deep-space antennae at four locations around the world. These are in addition to the U.S. Air Force's Eastern Test Range facilities, with installations as far away as the Canary Islands and South Africa, which are used by NASA as well.

During the past year the United States, through its embassies abroad, negotiated extensions of agreements with Ecuador, Mexico, and the United Kingdom. In addition, modifications of existing agreements have been or are being negotiated with Australia, Malagasy Republic, Spain, and the United Kingdom in preparation both for Project APOLLO and for new or expanding scientific satellite programs.

Optical Tracking Stations

An exchange of letters between the American Ambassador at Addis Ababa, on behalf of the Smithsonian Astrophysical Observatory, Cambridge, Mass., and the Haile Selassie I University was effected October 13, 1965, covering the establishment and operation of an optical (Baker-Nunn) tracking station near Debre Zeit, Ethiopia. This agreement was reached after protracted negotiations commencing in July, 1964. The need for the Ethiopian station arose because of the necessity to relocate for technical reasons the camera now at Shiraz, Iran. It will be one of nine SAO Baker-Nunn installations outside the United States.

Cooperation with ESRO

In October 1965 the House of Representatives approved a bill (H.R. 8210) which would enable the President to apply the provisions of the International Organizations Immunities Act to the European Space Research Organization (ESRO). The significance of this action lies in the fact that ESRO is seeking to establish a satellite telemetry/command station near Fairbanks, Alaska, as a part of its planned network in support of ESRO scientific satellites. While the station will be manned primarily by U.S. contractor personnel, ESRO desires to obtain for its non-American personnel privileges and immunities on the same order as those customarily extended abroad to NASA station personnel, as well as duty-free entry privileges with regard to station equipment and supplies. An amendment of the International Organizations Immunities Act, as contemplated by H. R. 8210, would satisfy ESRO's request.

The ESRO station in Alaska should be in operation by the end of 1966 in order to be available for the first of two launchings of ESRO satellites which are scheduled for 1967 under the terms of a cooperative agreement between ESRO and NASA. The Administration therefore urges the early consideration of S. 2130 (the companion bill now before the Senate) in order that action on this legislation may be completed during the current session of Congress.